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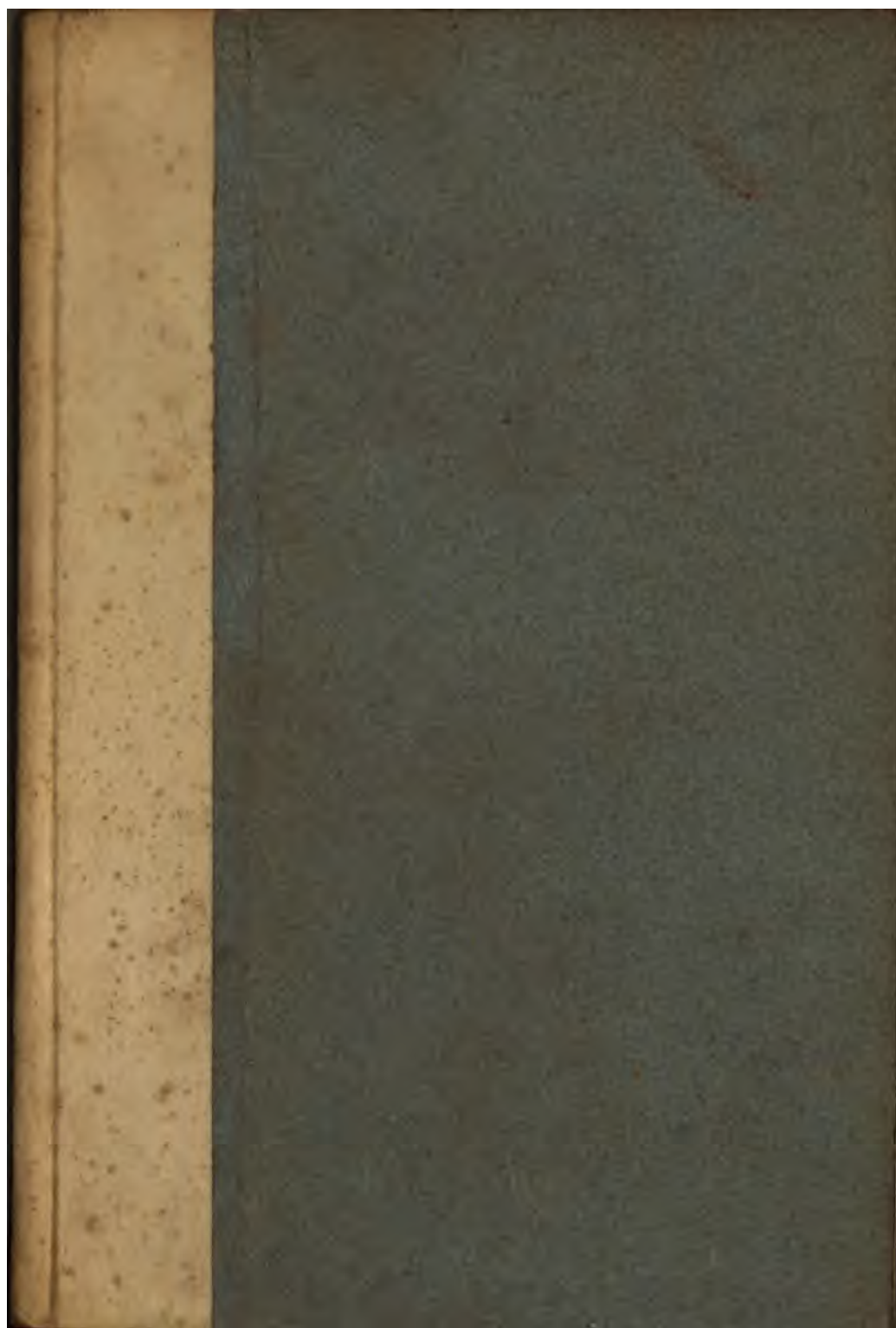
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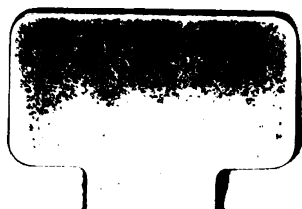
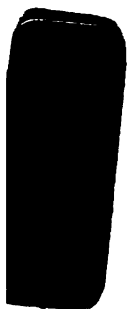
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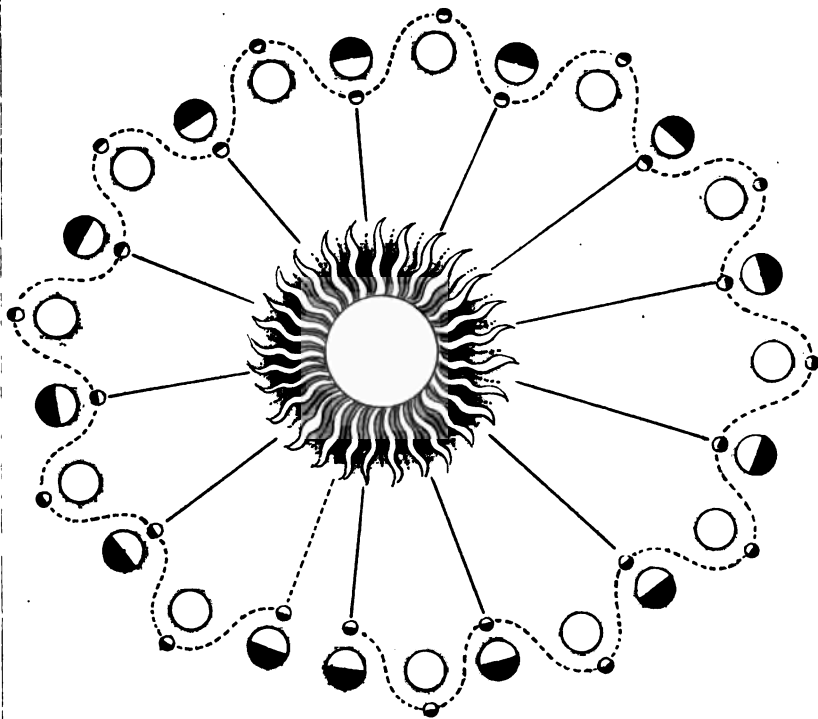
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DISCOVERY
AND EVIDENCE OF THE
SINGLE SERPENTINE COURSE
OF THE MOON
ROUND THE SUN AND THE EARTH.



"It would appear that there is a peculiarity in the moon's motion entirely unforeseen."—HALLEY.

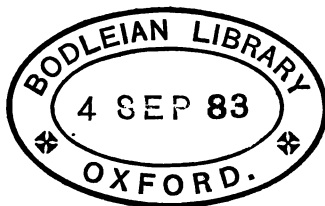
"I suppose it is known to all Fellows of the Society, that of late years there have been indications of something having gone fundamentally wrong in the lunar theory.—PRESIDENT OF ROYAL ASTRONOMICAL SOCIETY, *Burlington House, 13th April, 1883.*

LONDON:
ALFRED BOOT & SON, 24, OLD BAILEY, E.C.
1883.

DISCOVERY
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PREFACE.

THE Author's timidity and courage in presenting "the unforeseen" to the intelligent and scrutinizing, appear in the following pages. This is his humble introduction of a discovery that should be of universal interest, as from the long past we review the error that the whole universe was once supposed to revolve round the earth as a centre. Be it remembered that even now a somewhat similar delusion is entertained, in that the moon is still made to revolve in a circle or ellipse round the earth, to the perplexity of modern astronomers and confusion of mariners working in consequent error, while in charge of the immense maritime commerce of the world.

THE SINGLE SERPENTINE COURSE OF THE MOON.

HALLEY, Astronomer Royal of 18th century, says:—"It would appear that there is a peculiarity in the moon's motion entirely unforeseen."

At the Meeting of the Royal Astronomical Society at Burlington House on the 13th of April, 1883, the President said:—"I suppose it is known to all Fellows of the Society, that of late years there have been indications of something having gone fundamentally wrong in the lunar theory."

MANY attentive readers may conclude with me that the moon has one course only—a serpentine course round the sun and the earth—a deduction dispelling the illusion that the moon travels monthly in a circle or ellipse round the earth.

It may be noted that in all astronomical works, the movement of the moon is treated as a monthly circular or elliptical course round the earth, while complex undefined movements are speculated upon—such as arches, spirals, parabola and other combinations, but all failing in attempts to combine the supposed elliptical course with other imagined lines of movement.

Hundreds of pages are devoted to descriptions of the circular or elliptical course of the moon, and few pages only to the dilemma of combining therewith other imagined courses; and no published work deals with the possibility, or rather impossibility, of defining two or many adverse courses; but the needless dilemma can be escaped, since, by contemplation, conducted with the severest scrutiny of the

simple serpentine course, it will be found that there can be no combination with existing errors, since the moon's real course, hitherto "unforeseen," is found to be single, simple and evident.

The apology for my discovery of the "unforeseen" is, that many of the most important discoveries are results of unforeseen incidents. The manufacture of glass was indicated by the chance combination of fused sand with the potash of camp fires.

The invention of the microscope originated from children finding a magnifying curiosity in a bead of glass.

Prismatic rays were deflected through a chance knot hole in a shutter. The study of gravitation is said to have been prompted by the fall of an apple.

The condensation of steam—by a boy observing drops of water under the lid of a teapot.

The illuminating power of gas—by a chance jet through a tobacco pipe; sun pictures—by a chance pencil of light naturally focussed through the tangled branches of a tree. And innumerable other wonders might be cited as being accidentally discovered, but nevertheless studiously pursued. And to me, the fracture of a locomotive wheel suggested the impossibility for the moon to travel monthly in a circle or ellipse round the earth.

LECTURES.

SUMMARY OF LECTURES GIVEN AT THE
GRAMMAR SCHOOL, NEW CROSS, S.E.

By Permission of WALTER BLACKBURN, Esq., C.M.,
Head Master ;

The REV. J. D. VAN DER STRAATEN, M.A., B.D. (OXON.),
Presiding.

SUBJECT :—THE SERPENTINE COURSE OF THE MOON ROUND THE
SUN AND THE EARTH.

Rev. Sir, Ladies and Gentlemen—The importance of more correctly ascertaining the mean distance of the sun, moon and planets from the earth, and their relative movements, is a research of universal interest, since calculation of time-bearings and distances of celestial bodies is the very essence of the science of astronomy—a science of inestimable value—a very necessity to mariners traversing oceans and navigating distant seas.

Acknowledgment of general desire to obtain more correct knowledge is shown by the fact that England and other nations sent forth numerous expeditions at great cost to observe the rare occurrence of the transit of venus with the sun, in order to discover nearer approximations of the sun's mean distance from the earth.

In my address I am almost compelled to refer briefly to

historical facts, as showing the gradual progress of the science of astronomy. In doing which I humbly acknowledge the debt due to all the eminent pioneers—the very founders of all advanced knowledge. Notwithstanding, many items of their deductions are now known to be utterly wrong.

Philosophers up to the time of the Homeric era made the world as a table or basin, the sun, moon and stars rising in the orient and setting in the occident, yet nations by a primitive sun and star-dial timed their military watches and intervals of daily labour.

Next, after many generations, it was propounded that the earth was a globe, the sun, moon, and stars—the whole firmament—revolving daily round the earth; and this delusion of a revolving firmament was entertained for centuries; nevertheless the sun-dial gave the time of day, and the rising and occultation of planets with the stars, and even the times of eclipses, were approximated.

Next, after ages, it was discovered that the earth revolves once daily as on an axis, so accounting for the visual illusion that the universe revolves daily round the earth, and this, the modern system founded by Copernicus, Galileo, Kepler, Newton, Herschel, and others, is the era of astronomical knowledge in which we live; and the sun-dial, as of old, still shows the time of day.

And while appreciating the progress of astronomical knowledge, advanced by thousands of years of study and research, during which time, the unerring sun-dial has ever indicated passing time—it would be a vanity unbecoming this, or any age, to suppose that the nominally exact science of astronomy is perfect.

I have been asked how I can venture to add to the

discoveries of the great Newton. My reply is, that Sir Isaac Newton, and all true philosophers, have acknowledged their works as being left unfinished—as well they might, seeing that the sextant, the chronometer, and other exact instruments essential to astronomical observations, were not invented till long after Newton's time; but then it is objected that modern astronomers possess these refined instruments; and so I might be driven to argue round a circle, in preference to which I reply, the pleader is not called upon to hold two briefs, one pro and one con, at the same time.

My duty is to expound, to uphold, and defend my discovery of the "*moon's single serpentine course*" round the sun and the earth, hitherto unforeseen—leaving it to others to disprove the same if possible.

But a veto against progress in knowledge cannot be allowed to date from any age, past or present; otherwise, power-looms, gaslight, railways, steam navigation, the electric wonders, and other marvels should be opposed as myths, and all patent offices should have been closed ages ago as protest against advancement.

My object, on the contrary, being to promulgate knowledge as in relation to my discovery, I hold myself bound, and am desirous, to reply to questions kindly put, in order that what I propound may be clearly understood.

The astronomer or student mapping the course of the earth, if only as to one lunar month, setting out by calculations, or from ephemeris, the relative bearings and distances of the moon as to time, will find it impossible to delineate the moon's path otherwise than as a single serpentine course round the sun and the earth, and in the appendix clear instructions are given to young students whereby, at a

trifling cost, in one half holiday, the single serpentine course of the moon on a scale of 45, or 90 feet, or yards, to the lunar month may be demonstrated in a field, so affording an interesting and instructive sight to friends of progress.

The diagram (figure 1) is one familiar to all the world. I must, nevertheless, dwell earnestly, and with profound respect, even to the error thereby taught, for the diagram should be cherished with admiration, since it is an illustration of the formula by which the immortal Newton determined the laws of gravitation. If anything could have induced me to delay declaring my discovery it would be from my finding an error, an important oversight, almost conditional to the era of that great philosopher; nevertheless, an error perpetuated by every age since Newton's time.

Artillerymen, riflemen and sportsmen, know that a point-blank shot falls much below the mark aimed at.

Archimedes, without discovering the mystery of gravitation, was engaged for many years in the study of momentum and the laws of leverage, although the battering ram had then been in use for ages. Then Galileo correctly ascertained the beats of the pendulum, and determined the fall of any weight to be 16 feet the first second.

While Newton, reasoning on the antecedents of science, concluded that, since swinging weights or falling bodies, whether a stone dropped from the hand or a rock from a precipice, had by some then unknown principle a tendency toward the earth; and if the mountain boulder, why not the moon? he said. And after deep research and elaborate calculations the deflection of the moon toward the earth was indicated, but not conclusively; and so Newton delayed the study for 14 years, after which one of the greatest disco-

veries made by man—the determination of the universal laws of gravitation was verified for all time.

Doubtless it may appear to be a presumption to point to an error in the reasonings of so great a man. Had the error been a disputable trifle, I should not have subjected myself to public judgment ; but seeing and knowing that the error is misleading as to the very movement of the moon, my duty to declare the same is imperative.

Sir Isaac Newton reflected that a missile, whatever its initial velocity might be, is deflected toward the earth 16 feet the first second, and it occurred to him to seek to discover if the same law applied to the distant moon ; and, calculating the measure of the moon's supposed course round the earth during the lunar month, he obtained a deflection of 16 feet toward the earth during one minute, while the moon travelled 30 miles—a velocity of half-a-mile a second.

The moon, being 60 times more distant from the earth's centre than anything near the earth, he calculated by the squares of the distances that the moon would take 60 seconds to deflect 16 feet toward the earth, while the shot, on account of its proximity to the earth, would, with a like velocity, deflect 16 feet in one second, which is an accepted axiom,

Fig. 1 represents the traditional course of the moon around the earth during the lunar month ; the new moon being between the earth and the sun, the sun being supposed by scale from centre to centre to be some 30 feet distant from A, the right line path, A B, being ascribed to planetary bodies as travelling therein with their initial primitive velocities.

It should be noted that the moon, if assumed to be coursing from A to D, that is, from new moon to first

quarter (the circular distance being some 360,000 miles), the moon being deflected from the sun a distance of some 240,000 miles, the moon still travelling in a circle or ellipse to full moon, E, when the moon has receded from the sun 480,000 miles, the measure of the line A E.

But whence comes such deflection from the sun? Why, by the earth's attraction, it is said.

But how about the moon's position at F, where it is evident the earth's attraction is not counter to the sun's attraction of the moon, but, on the contrary, is pulling the moon nearer to the sun.

Then, again, instead of the moon, as seen from the earth, receding from the sun 240,000 miles, and travelling to the left and to the east, the observer facing the south, the moon is really travelling to the right and to the west (fig. 2), receding from the sun 240,000 miles, while travelling round the sun a distance of over 11 million miles from time of new moon to first quarter; and so the old error must be corrected by reversing the moon's assumed path toward the left and the east (fig. 1) as to the right and to the west (fig. 2), and the distance coursed from new moon to first quarter must be increased from 360,000 miles to over 11,000,000 miles—more than thirty-fold (see fig. 5).

Before referring to the tabular distances between the sun, the earth and the moon, and the lines and forces of their relative attractions, I have to remark that mere verbal arguments, imagined to raise or confirm doubts, are non-conclusive in matters of demonstrative science; and, while every thinking mind is free to form an opinion, none can give demonstrative evidence without producing calculations and lineal drawings or orrery models showing the moon's real path.

Seeing by the old calculations that the moon is said to travel, as we face the south, from west to east half a mile a second, instead of east to west, nearly 18 miles a second, time will not be wasted in consideration of momentum due to velocity, a consideration indispensable to right comprehension of the laws governing all moving bodies.

The student may well be perplexed that, as of old, the earth is still made a centre of astronomical calculations, the earth being made an imaginary centre, the sun being assigned to the first point of *aries* at the vernal equinox, thence coursing onward in the *ecliptic* round the earth; but to comprehend the course of the moon, the sun must be regarded to be the central body and the earth placed in the first point of *aries* at the vernal equinox, thence travelling in the *ecliptic* round the sun; but such truthful usage involves an apparent dilemma, since it is known that the moon traverses the *ecliptic* twelve times a year, the elucidation of which is beyond the limits of this essay, although the solution of the apparent difficulty is quite prepared, and will be given in a second edition.

MOMENTUM.

The physician prescribes nourishment, air and exercise, and there can be no exercise without momentum; by nourishment, by air and by rest a storage of power is accumulated in the muscles, which, acted on by the nerves when governed by the brain, induce movement, and so momentum.

I learned from professor Arnott to imagine varieties of inanimate nature to be endowed with speech.

"We have no whims or fancies," he made them say; "with us there is no error or accident; our actions are all sure and positive."

And with me, the ideal is that every inanimate atom in creation acts in perfect obedience to laws, positive, infallible and Divine.

Momentum, if permitted to speak, says:—"Beware not to trifle with me; take heed to use me as a friend, for I am irresistible as a foe."

Physical momentum may be called into action from the storage of muscular power in a vast army of men, the sergeants and officers being the nerves of the phalanx, governed by the brain of the staff commander, from which brain the order flashes as by electricity to the brains of thousands of men and horses. Onward charge when momenta developed is tremendous, irresistible and awful.

Or momentum may be called into action by a spirited horse fresh from his rest and feed of corn. He is saddled, he trots; beyond control, he gallops at his highest speed; instinct in an instant prompts him to avoid a brick wall shielding a precipice—he puts on his utmost brake power. Momentum says, too late; the brick wall must be cast down, and horse and rider must plunge over the precipice; so teaching others that momentum is not to be trifled with.

Vast physical momenta we know to be produced by solar heat, raising visible and invisible vapours from seas and lands—the mists condensing into rain, and falling on mountains and plains of a continent, producing rivulets and rivers, feeders of the lakes, which lakes, by overflowing, supply the Rapids and the falls, thence returning to the parent ocean.

Thus—

"Water parted from the sea,
Through the valley though it roam,
Ever struggling to be free,
Courses to its native home."

The notice, "it is penal to trot," I thought superfluous on

looking down from the wire bridge high above the Rapids ; the stream, thousands of feet wide, ever rushing onward, with a velocity of twenty miles an hour, a momentum, however vast, to be augmented twenty-fold as the incessant flood is precipitated into the foaming abyss of Niagara.

Ni-a-ga-ra ! Ni-a-ga-ra ! is the native Indian's exclamation, expressing the ocean leaping from the moon.

Returning by rail from Niagara, I wished it had been made penal for a driver to gallop along the precipitous banks of the Hudson. Not liking the oscillation of the cars, I walked through the train to the engine platform to seek the cause ; and presently the engine driver said, " We're off the line ! Off steam ! On brake ! " to do which I lent a helping hand. Next, I received the order to leap off, followed by a push, compelling me to spring clear of the wheels, the driver following me ; and, although travelling at 20 miles an hour, we were both safely deposited on a deep bed of snow. As we had set the bells ringing, the guard in rear had put on the brake power, the whole force of steam the while blowing off furiously, endangering the bursting of the boiler.

Happily, the train stopped within a foot of the river embankment. Had we been travelling at 30 miles an hour, the whole train would have bounded down into the river, and we should have been reported missing. Since my lecture, as above, sad confirmatory evidence is telegraphed, thus :—" *New York, March 31st, 1883.* A train on the Cincinnati Southern Railway ran off the line, while going at a rate of 40 miles an hour. The train went down an embankment 50 feet deep."

And, as many venture to travel at a speed of 60 miles an hour, those who pay deference to the powers of

momentum should choose the ordinary train in preference to the express.

But we are told that a collision at 20 miles an hour may be as fatal as at 60 miles an hour.

Momentum says, don't believe it.

At 20 miles an hour a train may be stopped, or, at least, the speed reduced within 50 yards; at 60 miles, or 3 times the speed, momentum is 9 times as great, making it evident that if momentum due to 20 is difficult to reduce in time of danger, to reduce the momentum of 60 is next to impossible, unless a long unobstructed run intervene.

Before discussing celestial momentum, I briefly refer to mechanical momentum.

I have invited attention to the dangerous properties of momentum, and it may appear strange that the engineer uses momentum to govern momentum, in the practice that "like cures or governs like."

The model with which I demonstrated in my first lecture is placed, as I said, in the hands of the statue to science on the City Viaduct as being the best emblem of dynamical skill, and is known to the engineer as the governor—the automaton governor that never errs. Set to govern uniformly any speed, it does it, insuring advance from any declining velocity and checking any excess.

Although simple in construction, the governor is constantly obedient to laws in relation to ponderosity or weight, velocity, momentum, gravitation and centrifugal action—five governing principles of every sphere in the universe.

The estimated mass of the moon, multiplied by the square of her initial velocity, gives momentum in tons beyond comprehension.

Yet, while we placidly look upon the gliding moon, we may

contemplate that we see a globe in bulk and weight exceeding by millions all the hills and mountains of the earth, and ever plunging round the sun with a velocity a thousand times faster than the express train.

The velocity of the moon being a thousand times greater than that of the express train, the momentum of one ton weight in the moon is a million times greater than one ton in the fast train. Contemplation of this certainty led me to discover the utter impossibility for the moon to travel monthly in a circle or ellipse round the earth.

Yet, in this nineteenth century, we all know that the peoples of the whole world are taught that the moon moves monthly in a circle or ellipse round the earth! confirming to the nineteenth century Halley's conclusion "*that there is a peculiarity in the moon's motion entirely unforeseen.*"

The astronomer or student mapping the course of the earth (if only as to one lunar month), setting out by calculation, or from ephemeris, the relative bearings and distances of the moon, will find it impossible to delineate the moon's path otherwise than as "*a Single serpentine course round the sun and the earth.*"

Some professional astronomers have already given acknowledgment of the fact, and it may be assumed that all astronomers will eventually do so.

I trust it may be seen that I do not advance a new theory in vanity, or as a mere novelty. The very importance of the subject is my plea for kind consideration.

Fig. 1 represents the old imagined course of the moon round the earth, the moon being supposed to travel to the left from time of new moon, A to B, in 24 hours, thence onward to first quarter, to full, to last quarter, to new moon again, so completing a monthly round of the circle or ellipse.

Instead of which, the moon, during the first 24 hours, travels in a course to the right, diametrically opposite. (See A to C, fig. 2.)

The (finer lines) fig. 2 show the onward course of the earth and the moon during 24 hours; and it may be seen that the lines, perpendicular at new moon, gradually incline as the moon courses onward, the seeming loss of the moon's distance coursed being due to the moon's divergence by lateral movement in her ascending or descending nodes.

Fig. 4. The width of the limits of the course of the moon are drawn in excess in order more clearly to represent the relative tendency of attraction of the sun and the earth, and it will be seen that the attraction of the sun and the earth, if taken as equal, or as 1 to 1, are at the time of new moon pulling the one against the other; but as earth and moon course onward round the sun the lines of attraction of the moon to the earth gradually incline till the time of first quarter, when the earth's attraction is at a right angle to the sun's attraction, instead of being perpendicular as at new moon. The sun's attraction being now unchecked till the line of the earth's attraction, tends gradually to draw the moon to the sun; the moon, however, still receding from the sun till time of full moon. How is this? Why, let it be remembered, that a mass, such as the moon, ever speeding onward with a velocity exceeding 5,000,000 feet every minute is only gradually checked by the feeble restraining pull of 16 feet a minute; and, valuing the earth's attraction of the moon as 1, and the sun's attraction of the moon as 1, the combined attraction of sun and earth prevent the moon from flying off at a tangent at the time of full; and the attraction of the sun and the hourly increasing attraction of the earth together draw the moon to the last quarter, after

which the moon's initial velocity and the full attraction of the sun, aided by three or four days' pull of the earth's attraction, bring the moon again to the position of new moon, with neutralized attraction between the sun and the earth.

Fig. 3 is an illustration of the moon's serpentine course round the sun and the earth during half-a-year, the width of the path of the moon being drawn many times in excess, as necessary for illustration.

Fig. 5, being one lunar month of the moon's serpentine course round the sun and the earth, drawn to scale of half-inch to one million miles. Herein it will be seen that the courses of the earth and the moon are almost parallel, the extreme deflection being 1 to 44; that is, the moon from new to full recedes from the sun at most half-a-million miles while travelling onward 22 million miles; *and it should be noted that there is no indication of a circular or elliptical course round the earth.*

Fig. 6 is to illustrate the relative actions of forces of attractions in circles of different sizes.

Suppose a mass travelling with great initial velocity, V , to be passing in the straight line indicated by the arrow, and that the central attraction as of the sun, S , is just sufficient to restrain the mass to the circle of 4 inches, or 4 millions radius.

Query—What must be the force of attraction to restrain the mass travelling with velocity, V , so as to cause it to travel round a circle, E , whose radius is half an inch or half million?

Answer—The force of attraction in the circle of half inch radius must be eight times as strong as in circle of radius 4. And taking the moon to be a quarter of a million miles from the earth, and ninety million miles from the sun, the

earth's attraction with the moon would have to be 360 times as great as the sun's attraction with the moon to cause the moon to travel round the lesser circle as in (fig. 1), and this axiom (fig. 6) should entirely dispel the illusion that the moon courses in a circle or ellipse round the earth, since the maximum difference of governing attraction of the earth and moon and the sun and moon are at most as 2 to 1.

By fig. 7, the important axiom, is submitted in a manner to be comprehended by inspection or proved by geometrical calculation.

The perpendicular or tangent lines of the 5 arcs of circles A B C D E, being lineal equivalents of 5 constantly equal masses, velocities and momenta, the dark lines, A B C D E, being *rer sins* of arcs travelled, and are proportionals of the respective central attractions needed; hence the measure of the dark line, A, is double that of B, and the dark line of A 4 times D and 5 times E, or the proportions are as the degrees of the arcs, and also in proportion to the radii of the circles inversely.

Whereby it is seen that a mass moving with a constant velocity, V, and restrained to move in a circle, whether by gravitation to the centre, or by a restraining line from the centre, and supposing the gravitation or cord to be just sufficiently strong to lead the mass to the larger circular course—the radius being 100, necessitates the condition that the strength of attraction of gravitation, or the strength of cord or rope must be 100 times as strong to restrain the same mass, velocity and momentum to a circle whose radius is 1.

The following definitions of distances, &c., are not held to be critically correct, since astronomical estimates of the

earth's distance from the sun have varied several millions of miles during the last fifty years. The figures given are approximate to recent estimates generally accepted pro tem.

Moon's mass or weight	1	} or {	Earth's mass	1
Earth's " "	49		Moon's " "	$\frac{1}{49}$
Sun's " "	1,538,600		Sun's " "	314,000
			Miles	
Earth's mean distance from the sun			91,430,000	
Moon's " "			91,430,000	
Moon's mean distance from the earth			238,800	
Earth's mean velocity round the sun			65,639 an hour	
Moon's " "			65,639 "	
" " "			1,094 a minute	
" " "			18 a second	
" " "			96,254 feet a second	
Moon's mean initial velocity per minute			5,775,240 feet	
Moon's gravitation to the earth per minute			16 "	
Power of initial velocity of the moon 360,000 times greater than power of moon's gravitation to the earth.				

Maximum attraction of moon to the sun being 1:—

Query—What is attraction of moon to the earth and to the sun? Answer— $\frac{1}{2}$, or 1, or 2.

RULE FOR STUDENTS.

Square the moon's mean distance from the sun = A.
Square the moon's mean distance from the earth = B.
Then, inversely, the earth's attraction of moon = A*
 sun's " = B*
B* to be multiplied by sun's excess of mass, 314,000
times earth's mass = B** the sun's attraction
of moon.

And now to conclude my address, inevitably dealing with high numerals and lineal diagrams inseparable from the

subject of my humble efforts, I ask for your interest as to the moon's real course ; for all of us are clothed and fed, and supplied with luxuries, borne to our shores under the light and influences of the moon, and Halley's declaration should be borne in mind, "*It would appear that there is a peculiarity in the moon's motion entirely unforeseen ;*" and it is found that not only have the movements of that guiding orb, the moon, been undefined, but the best charts of our great world are still unfinished ; and under such difficulties the anxious mariner, charged with treasures of merchandize, and the greater responsibility of a human freight, depends for his steerage guidance, on minutes and seconds of the apparent movements of the sun, the stars, and the moon.

Thanking you, reverend sir, and you, ladies and gentlemen, for patient attention to my disquisitions—as an old man, “often tempest tossed in distant seas”—I now here on shore calmly express a pride, in that the students of the New Cross Grammar School—a school founded under illustrious patronage—have, under guidance of their able headmaster, reproduced the large facsimiles of my diagrams, here hung upon the walls, and deserving close inspection, to the credit of the students who have also zealously and cleverly set out and fielded an Orrery demonstration on a scale of 45 yards to the lunar month, showing the onward course of the moon round the sun and the earth, the earth's advance in the ecliptic to days, hours, and minutes, the moon's southing age, her longitude and latitude, and bearings and distances from the earth, her daily phases, perigee and apogee, her position in her ascending and descending nodes, and the two partial eclipses of the sun in one lunar month, and so all the phenomena of her ever onward planetary course

round the sun and the earth—a worked-out example, surely to be soon followed, not only in the counties of Britain, but also on the continent of Europe, in our several colonies, and all the civilized nations of both hemispheres.

In hope of which I humbly subscribe myself

A devoted public servant,

W. H. PHILLIPS.

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APPENDIX.

The single serpentine course of the moon round the sun and the earth is easily demonstrated on a large scale by use of the formula described, and by which means public demonstration will be given.

EXAMPLE TABLE A.

Phases, 1884.	P.M.	Meridian Passage.	Moon's Latitude.	Miles from Earth.	Earth right Ascension.
	h. m.	h. m.	° ' "		h. m. s.
New Moon, 26th March...	17 47	0 0	S 1 24	230,000	0 25 30
First Qr. 2nd April ...	9 17	6 23	S 5 11	237,000	0 49 40
Full, 9th „ ...	23 44	12 22	S 1 6	250,000	1 17 36
Last Qr., 18th „ ...	3 55	18 48	N 5 13	245,000	1 47 48
New Moon, 25th „ ...	2 57	0 0	S 1 9	227,000	2 13 52

A post or iron rod is placed 2 ft. 6 in. out of ground, in line with some clearly visible distant mark, such as a church steeple, a flagstaff, or the trunk of a distant tree.

At a right angle from said rod, marked Equinox, a strong copper wire is extended some 92 yards, having a looped end to place over sun-centre post, S, the wire having a handle at other end by which the wire is stretched straight by one person, two or three assistants lifting the wire from the grass that it may be placed straight. The wire being

stretched, is to be carefully measured, marked and labelled near handle $91\frac{1}{2}$ yards.

The centre post, S, is then to be moved and firmly fixed truly $91\frac{1}{2}$ yards distance from equinox, and at a right angle from distant steeple, D, as observed from equinox.

With the wire radius, $91\frac{1}{2}$ yards, the arc of a circle is struck, and the ground pegged every $14\frac{1}{4}$ inches, the pegs being labelled 1, 2, 3, &c., to 60, as measures of time minutes of right ascension, at RA 60m. from equinox the peg is marked 1 hour RA, thence proceeding with other minute pegs 1, 2, 3, &c., to the extent of 2h. 20m. from starting point.

By sextant observation of two marks on a long vertical pole the arc may be struck with precision without a wire.

Before fielding is commenced a deal standard is prepared, 2 ft. 6 in. high, and 2 in. square, having a $\frac{1}{2}$ in. rod deeply fixed into lower end, and projecting so that the rod may spike a foot deep into the ground. On the top of the standard a circular table, 15 in. diameter, is firmly fixed at an inclination of $23\frac{1}{2}$ degrees, as inclination of ecliptic, exactly at lower and opposite to elevated point of ecliptic an arrow is to be marked, always to be made to bear on stella or steeple distance, D, by sighting two erect spike rods, one at the arrow on depressed ecliptic, and one directly opposite.

In the centre of fixed inclining table, and projecting at right angles thereto, a wire screw is carefully fixed as centre of earth, the screw, projecting half-an-inch, is provided with a button, an inch or more in diameter, to screw on and off.

A $\frac{3}{8}$ thick card disc, 14 in. diameter, having a hole in the centre that it may be turned round on centre screw, is placed over centre and held down moderately tight by the

screw button, the circumference of the disc being divided into 24 hours, numbered to the right like a clock, each hour being divided into 60 minutes.

Then referring to a table made out to the time of moon's southing every day of the lunar month, as in Appendix, Example Table A, it is seen that it will be new moon on March 26th, 1884, 17h. 47m. p.m., wherefore the disc standard is to be spiked into the ground in right ascension 25m. 30s.; the earth's position at that time, and the disc standard is to be turned in the ground centre so as to bring the two sight spikes projecting from winter and summer solstices to bear on steeple or mark D.

The card disc is then moved to bring 0 hours to bear directly on sun staff, S, and a rod projecting 2 ft. 7 in. out of ground is then placed in position of new moon, and southern partial eclipse of the sun, the moon's distance from earth's centre being adjusted to scale of 250,000 miles to 9 inches, and the moon's rod depressed into ground, so that the centre of a ball inserted on top of rod may be $1^{\circ} 24'$ south latitude, that is $1^{\circ} 24'$ below upper surface of table at O, one hour of disc being the scale of 15 degrees.

The disc standard is then removed, and a rod 2 ft. 6 in. out of ground is placed in its position, on the top of which a larger ball is placed to represent the earth, from the centre of which the south latitude of the moon can be readjusted. Thirty moon balls should be painted vertically, one half white, one half black, the white side always being presented to sun, S, so that at any age of the moon, the earth centre being between the moon and the observer, the phase of the moon is seen from day to day.

The disc standard is then spiked into the ground, 0h. 49m. 40s. R.A., the position of the earth when the

moon souths 2nd April, 9h. 17m. p.m., the standard being carefully adjusted to bearing with D as before.

6h. 23m. of card disc is then made to bear on sun, S, and moon ball, the white half facing sun, S, is placed on rod at O, the meridian of Greenwich, and adjusted to $5^{\circ} 11'$ south latitude, and centre distance as in table, 237,000 miles to scale, when the moon, viewed from behind earth's centre, is seen to be at first quarter, half white half black.

The earth rod and ball being placed in right position as to RA, and the moon rod and ball being adjusted to south latitude and distance, the same process is repeated, placing disc standard at 1h. 17m. 36s. RA, as at full moon time, and again in 1h. 47m. 48s. RA, as at last quarter, observing that moon's latitude is north or above table surface, then lastly at 2h. 13m. 52s. RA, for new moon with latitude $1^{\circ} 9' S$, and second partial eclipse of sun in southern hemisphere.

After which the same process has to be acted upon from the time of moon's southing on 27th March, and so on daily throughout the lunar month, on the completion of which evidence is afforded to inspectors. First, that at one view the earth's true daily position in her orbit round the sun is seen, also the moon at one view, showing her daily advance in the single serpentine course, her descending and ascending nodes, her varying distance from the earth, and the illumined crescents, quarters, and other phases of the moon, by which demonstration it is made manifest that the idea of a circular or elliptical course round the earth is to be considered only as a bygone illusion.

And when the moon's single serpentine course round the sun and the earth is duly studied, the same formula will be found to apply to other satellites, and the imagined

aberrations consequent to the elliptical theory will cease to interfere with true determinations of terrestrial longitudes, but not till it is seen that the moon and other satellites travel onward round the sun with their own planetary velocities in slightly undulating rhythmic waves.

FIG. 7

